

## Optimizing learning engagement and performance in technical education: Harnessing the power of video tutorials for enhanced motivation and skill development in Shield Metal Arc Welding Subject

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**Abstract:** This study aimed to enhance the quality of Shield Metal Arc Welding instruction in Class XI Welding Engineering at State Vocational High School 1 Bukittinggi through the integration of interactive media videos. Employing a class action research design with saturated sampling, the research findings revealed that the implementation of video tutorials significantly improved student motivation and learning outcomes. The use of video tutorials captured students' interest, resulting in increased motivation for learning Shield Metal Arc Welding. In the initial cycle, student motivation in Class XI Welding Engineering at State Vocational High School 1 Bukittinggi, as measured in meeting I, stood at 54%, indicating a less motivated state. By meeting II of cycle I, the motivation increased to 61%, categorized as moderately motivated. In the subsequent cycle, meeting I recorded a motivation level of 72%, demonstrating a motivated state, while meeting II in cycle II reached 82%, indicating a highly motivated state. Consequently, there was a noticeable progression in student learning motivation from cycle I to cycle II. Furthermore, student learning outcomes in Shield Metal Arc Welding for Class XI Welding Engineering at State Vocational High School 1 Bukittinggi improved when videos were utilized as interactive media. In cycle I, the average student learning outcome was 77.88, categorized as moderate. In cycle II, the average increased to 79.06, reflecting a high level of achievement. This indicates a positive shift in student learning outcomes, moving from moderate to good performance.

**Keywords:** Motivation; Interactive media; Learning outcomes; Shield metal arc welding; Welding techniques

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### 1. Introduction

Along with the times and the increasingly high level of competition, Vocational High School (*Sekolah Menengah kejuruan/SMK*) are required to produce qualified, skilled graduates with expertise. Therefore, a quality learning process is needed so that student learning outcomes are as expected. According to ([Wardani et al., 2020](#)), Learning outcomes result from an interaction of learning and teaching actions. One of the problems that often occurs in the education process is how teachers deliver material that does not attract students' attention ([Rizaldi et al., 2020](#)) for example, the media used by teachers, such as whiteboards and projectors. If the teacher cannot communicate and utilise learning facilities properly, students will find it difficult to receive lessons, get bored quickly, and have no interest in learning. This results in students looking bored and less motivated to learn, which impacts learning outcomes that are not in line with expectations ([Tam et al., 2020](#); [Wuryandani & Herwin, 2021](#)).

Based on the results of observations at SMK Negeri 1 Bukittinggi by observing the learning process, interviews, and data on student learning outcomes in Shield Metal Arc Welding

subjects, it is found that students appear to lack full attention to the learning process, which proves that student learning motivation is low. Students' daily test scores are below the Minimum Completion Criteria ([Abidin et al., 2020](#)). Shield Metal Arc Welding subject in the Welding Engineering Department consists of theory and practice. One of the final objectives of the Shield Metal Arc Welding subject is that students are expected to understand the procedures in Shield Metal Arc Welding practice. In order to achieve learning objectives, the learning and teaching process requires planning according to the demands of the syllabus. Before students perform the Shield Metal Arc Welding practical process, students are expected to understand welding material in the form of material that discusses welding procedures and techniques used in Shield Metal Arc Welding subjects.

Using learning media in the learning and teaching process that has not been varied makes students quickly bored and less active in participation in learning. This certainly has an impact on the lack of student understanding of Shield Metal Arc Welding material ([Prasetya et al., 2023](#)). This indication is due to the ineffectiveness of the learning media used and the conventional learning and teaching process or not directing the role of students to be active so that students are less motivated to participate in the learning and teaching process ([Aufa et al., 2021; Soeprijanto et al., 2022](#)). This causes students to lack or even not understand the material the teacher provides before practice.

Based on observations and interviews with teachers who teach Shield Metal Arc Welding at SMK Negeri 1 Bukittinggi. The results show a lack of teacher creativity in teaching or a lack of variety in the learning strategies applied by the teacher. Teachers are more active in the classroom, and students are only passive and receive material. To overcome this problem, media is needed to display basic manual arc welding materials that are procedural and easy to understand so that students have extensive knowledge in the studied Shield Metal Arc Welding subject. The application of media in the form of videos in Shield Metal Arc Welding subjects is expected to help students understand the subject matter. The videos are expected to attract students' attention to learning to increase learning motivation ([Puspitarini & Hanif, 2019](#)). The use of interactive video media is also expected to accelerate student understanding and enthusiasm for what is conveyed by the teacher so that student learning outcomes improve in a better direction ([Hikmah et al., 2022](#)). Based on the explanation above, conducting video learning media research on Shield Metal Arc Welding subjects with introductory material for metal welding learning is necessary.

## 2. Methods

This study used classroom action research using action research methods. According to ([Meesuk et al., 2020](#)), Classroom action research is a research activity in a classroom context that is carried out to solve learning problems faced by teachers, improve the quality and results of learning and try new things in learning for the sake of improving quality and learning outcomes ([Juhji et al., 2021](#)).

The data needed in this study are the results of students' cognitive abilities tests after the action. The data source in this study was class XI Welding Engineering students of SMK Negeri 1 Bukittinggi in the 2023/2024 school year, totalling 32 students. The instruments in this study were ability test instruments in the form of objective tests and observation sheets of student motivation and learning outcomes. Data on students' thinking skills were obtained by giving tests as an evaluation tool to students.



Figure 1. Classroom action research cycle diagram

The tests in this study included a pre-action test, the final test of cycle 1, and the final test of cycle 2. This is done to determine the increase in student learning motivation seen in Eq. 1.

$$Value = \frac{f}{N} \times 100\% \quad (1)$$

To analyse the level of success and percentage of student learning completeness after the learning process by giving an evaluation in the form of a written test on the activities in the cycle ([Chan et al., 2021](#)). This analysis is calculated in Eq. 2.

$$(P = \frac{F}{N} \times 100\%) \quad (2)$$

The improvement of students' abilities is obtained by calculating the magnitude of the gain score. The amount of N-Gain is calculated with Eq. 3 ([Meltzer, 2002](#)):

$$(N\text{-gain} = \frac{S_{post} - S_{pre}}{S_{max} - S_{pre}} \times 100\%) \quad (3)$$

N-gain values are grouped into high, medium, and low categories listed in Table 1.

Table 1. N-gain assessment criteria

N-gain value	Category
$G > 0.7$	High
$0.3 < g \leq 0.7$	Medium
$G \leq 0.3$	Low

Each cycle was analysed with the help of SPSS v.26 to test the significant level of student ability.

## 2.1 Data collection using test sheets

Test sheets are needed to determine the extent of student mastery of the material that has been taught ([Gomba, 2019](#)). A test is one of the tools for making measurements, which is a tool for collecting information on the characteristics of an object ([Camacho et al., 2020](#)). The test given is objective. It is listed on the grid in Table 2.

Table 2. Lattice of question test assessment sheet

Elements	Learning outcomes
	Students can identify SMAW machine specifications and welding equipment, prepare welding materials, and identify electrodes.
SMAW Welding	Students can perform welding of plate-to-plate joints in blunt and angular joints in underhand, horizontal, vertical, and overhead positions with SMAW welding following code procedures.

## 2.2 Student motivation

Student motivation sheets are needed to determine changes in student motivation in the following learning, especially in SMAW welding. As seen in Table 3.

Table 3. Lattice of the test assessment sheet

Variable	Indicator
	Desire and desire to succeed
	The existence of encouragement and needs in learning
Assessment of learning motivation observation	The existence of future hopes and aspirations
	The existence of rewards in learning
	A conducive learning environment

## 3. Results dan discussion

This research was conducted in class XI Welding Engineering SMK Negeri 1 Bukitnggi in the subject Shield Metal Arc Welding semester 3 of the 2023/2024 academic year. The implementation of the action is divided into two cycles spanning two weeks with four meetings. Researchers will present the results using the implementation of class action research with a learning model in Shield Metal Arc Welding subjects using interactive media videos.

Video tutorials on SMAW welding learning can provide better accessibility to learning materials. Students can access the videos anytime and anywhere. The SMAW welding process can be challenging to understand by reading text or looking at pictures. Video tutorials allow students to see the welding techniques, correct movements, and best practices first-hand. This can enhance their understanding of technical concepts and skills. These video tutorials are designed to engage students actively. Using animation, simulation, or interactivity in the video can make learning more exciting and increase students' motivation to engage more deeply in the learning process. By considering these aspects, video tutorials in SMAW learning in engineering education can improve students' motivation and learning outcomes. It

is essential to continuously monitor and evaluate its effectiveness and adjust as needed to ensure an optimal learning experience.

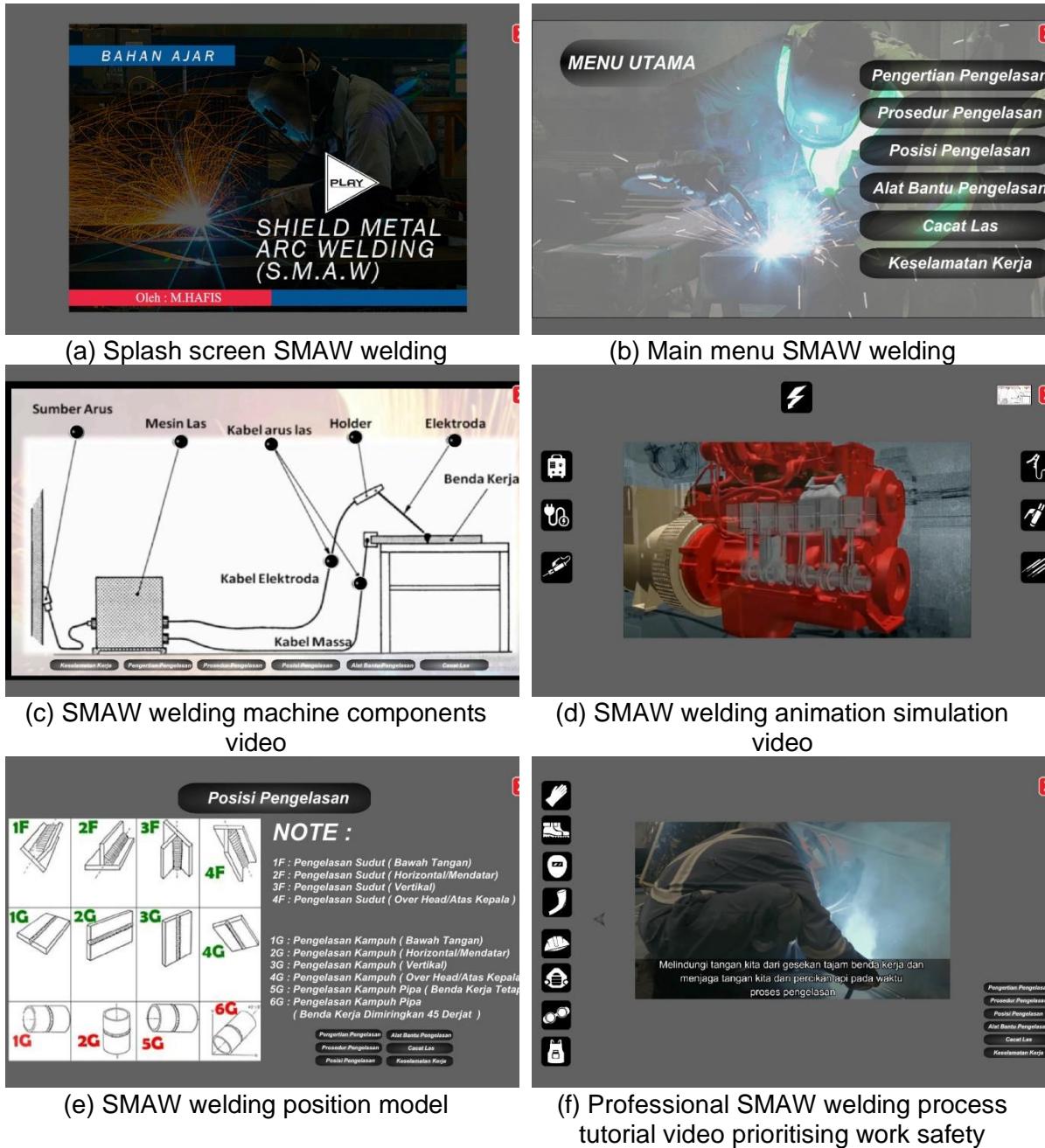


Figure 2. Results of SMAW welding video tutorial design

The ability to assess student learning outcomes in this study consists of pre-action, cycle one analysis, and cycle two analysis. Pre-action analysis ability is carried out before students are given action to know the initial ability of students before being given action. Based on research data on the learning outcomes of students in class XI Welding Engineering SMK Negeri 1 Bukittinggi, 14 students were complete in the pre-cycle, and 18 students were not complete with a classical completeness of 44%. In cycle 1, 23 students were complete, and nine were incomplete, with a classical completeness of 72%. Meanwhile, in cycle 2, 25 students were complete and seven students were not complete, with a classical completeness of 78%. The description of the achievement of learning outcomes for each cycle is listed in Table 4.

Table 4: Description of students' cognitive ability

No	Completeness	Pre Cycle		Cycle 1		Cycle 2	
		Students	%	Students	%	Students	%
1	Completed	14	44%	23	72%	25	78%
2	Not Completed	18	56%	9	28%	7	12%

A comparison of the average scores of students' learning outcomes in each cycle is shown in Figure 3.

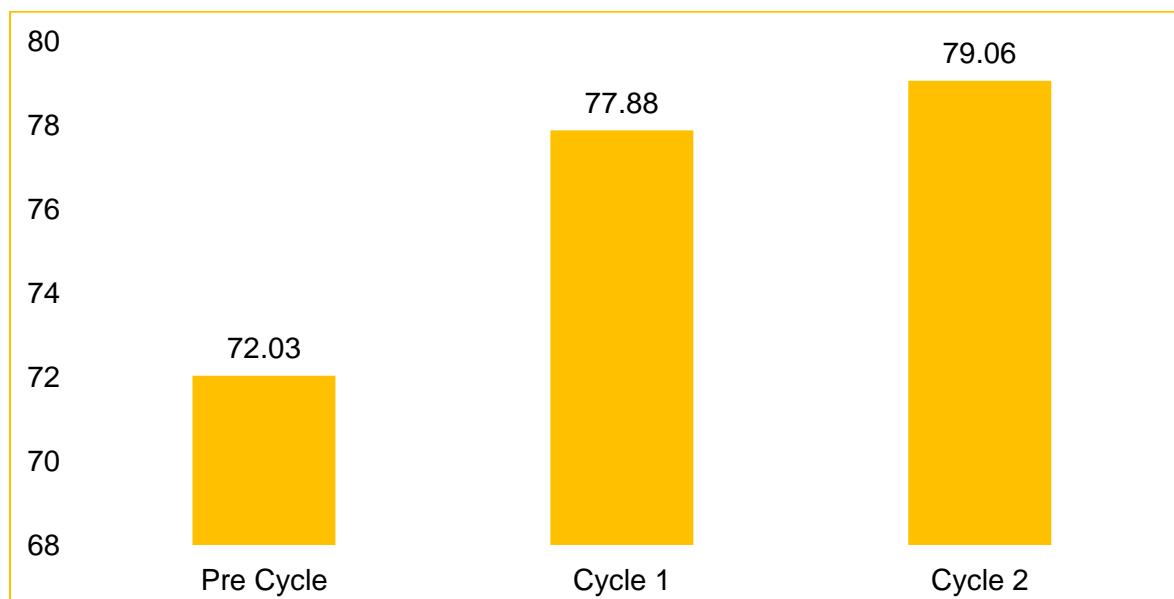


Figure 3. Comparison of average student learning outcomes in each cycle

In Figure, the pre-cycle average score is 72.03, which is still low and has not used video tutorials. While in cycle one the average value of student learning outcomes was 77.88, which was still below. Meanwhile, in cycle two, the average value of student learning outcomes was 79.06, which had passed the indications of success of completeness. The description of teacher and student observation scores is included in Figure 3.

Table 5. Description of N-gain in cycle 1 and cycle 2

Cycle	N-gain	Category
Cycle 1	0.62	Medium
Cycle 2	0.78	High

According to the acquisition of N-gain, there is an increase in students' abilities in cycle 1 to cycle 2 of each cycle. Based on the results of the N-gain test, the average result in cycle 1 was 0.62, which was included in the medium category, while in cycle two the average N-gain value was 0.78, which was included in the high category. It can be concluded that there is an increase in the average value between cycle 1 and cycle 2.

This research results from the State Vocational High School 1 Bukittinggi in the SMAW welding subject of class XI Welding Engineering students. Research data was obtained from assessing students' cognitive outcomes through test questions totalling 30 questions per cycle. This research was carried out in two cycles. The results of the study are expected to improve learning outcomes for students to generate interest in effective learning in the world of

education or provide solutions to existing problems. The instrument used by the research has passed an assessment, such as validation. Instrument validation was carried out by three validators: namely, one smaw welding learning material expert, one media expert for the application of video tutorials, and one motivational media expert for feasible use.

The application of video tutorials in SMAW welding subjects can make students more active and increase their enthusiasm for learning. From the results of the analysis of the validation of learning material experts and media experts, it is known that, based on the analysis of the data obtained, it can be seen from both cycle 1 and cycle 2 that there is an increase in student learning outcomes. This can be seen from the average value of student learning outcomes obtained from the pre-cycle value of 72.03, then cycle 1 of 77.88 and cycle 2 of 79.06. The data shows that the average value of student learning outcomes after using the case method learning model increased from cycle 1 to cycle 2. In addition to seeing the average value, an analysis of completeness based on effectiveness was also carried out. Based on the analysis in cycle 1, the percentage value of classical completeness was 72%, which was not effective, and in cycle 2, the percentage value of classical completeness was 78%, which was effective because it had passed the limit of the classical completeness value of 75%.

Relevant research from ([Singh et al., 2020](#)), "Application of Video Learning Media to Improve Learning Achievement of Class X Metal Fabrication Engineering Students in Oxy-Acetylene Welding Theory Subjects at SMK N 1 Pariaman. The results of the study show (1) there is a significant difference in student learning achievement between classes that use learning videos and those that do not use learning videos because the t-count price is greater than the t-table ( $5.57 > 2.0435$ ) in the t-test (2) the number of passing students in classes that use video media is more than in classes that do not use learning videos at the Minimum Completion Criteria (KKM) value. This can be proven that students who pass the KKM in the control class are 7 out of 31 children, and in the experimental class, 22 children out of 30 children.

#### 4. Conclusion

Using video tutorials as interactive media to increase student motivation and learning outcomes in Shield Metal Arc Welding subjects proved to be able to increase motivation and learning outcomes in class XI Welding Engineering SMK Negeri 1 Bukittinggi. Achievement of student motivation in learning Shield Metal Arc Welding in class XI Welding Engineering SMK Negeri 1 Bukittinggi by using interactive video media has increased, namely student learning motivation in cycle I meeting I is 54% with less motivated criteria; cycle I meeting II is 61% with moderately motivated criteria; and in cycle II meeting is I 72% with motivated criteria; cycle II meeting is II 82% with highly motivated criteria. So, there is an increase in student learning motivation from cycle I to cycle II. Moreover, the achievement of student learning outcomes in Shield Metal Arc Welding subjects in class XI Welding Engineering SMK Negeri 1 Bukittinggi by using video as interactive media has increased, namely the average value of student learning outcomes in cycle I with an average value of 77.88 with moderate criteria; and in cycle II the average value is 79.06 with high criteria. So, there is an increase in student learning outcomes classified as good.

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## Declarations

### Author contribution

M. Hafis as the researcher and data collector, Syahril as the direction and method provider in the research, Refdinal, and Mr Febri Prasety evaluated the research method, data analysis and provided evaluation Background of the Problem.

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### Conflict of interest

No conflicts of interest and approved the article for review and publication.

### Ethical clearance

The involvement of human subjects in this research complies with the Declaration of Helsinki.

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